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INFLUENCE OF GAS OIL ON COMPRESSIVE STRENGTH OF CONCRETE

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ABSTRACT

This research studies the effect of water/gas oil on the compressive strength properties of the concert. The concrete cubic specimens were prepared by using sulfate resistance cement (AL-Muthanna cement) with mixing ratio (1:1.5:3) (cement: sand: coarse aggregate) concrete specimen cubic was prepared and socked in water and a mixture of water/gas oil (30%-70%) at room temperate for immersion age (7-28-56-88-118-148) days. The experimental results indicate that the percentage of reduction on compressive strength of concert immersed in water/gas oil deceased with different percentage (1, 15, 13, 4, 34, 35) % than the specimen in water for same age ofthe socking.

KEYWORDS: Concrete Mixture, Compressive Strength, Socking, Gas Oil

INTRODUCTION

Concrete is a composite material composed of coarse granular material (the aggregate or filler) embedded in a hard matrix of material (the cement or binder) that fills the space among the aggregate particles and glues them together [1]. A concrete mixture ratio of 1 part cement, 3 parts sand, and 3 parts aggregate will produce a concrete mix of approximately 3000 psi. Concrete mixture can be designed to provide a wide range of mechanical and durability properties to meet the design requirements of the structure. The use of concrete, worldwide, is twice as much as steel, wood, plastics, and aluminum combined. Concrete's use in the modern world is only exceeded by the usage of naturally occurring water [2]. Concrete suffer from one major drawback compared with other materials like steel and timber; its strength cannot be measured prior to it being placed. Factors affecting concert compressive strength,and those factors are (water cement ratio, mix ratio degree of compaction types of cement, the grade of aggregates,design constituents, mixing method, placement curing method and the presence of contaminants.Contaminant is concrete may be salts (chlorides, sulfates, etc.) sit, coal and hydrocarbon (petroleum product, etc.). Lubricating oils, asphalts and other valuable products. It is hydrocarbon composed mainly of hydrogen and carbonalong with minor impurities like sulfurnitrogen and oxygen generallyraw material for concert predation should be free from contaminates. Laboratory test of concrete cubes cured various hydrocarbon computes was undertaken.

The presence of contaminants seems to interfere the cement –water binding reactions, delaying or preventing full hydration of cement particles [3]. The effect of petroleum contamination on concrete strength was conducted the compressive and flexural strength results indicated that irrespective of the soil typesconcrete with higher petroleum contaminated soil (PCS)/sand replacement ratio develops lower values at early and late stages. The compressive strength of concert is the most common performance measure used by the engineer in designing building and other structures. The compressive strength of concrete is about ten time its tensile strength [4]. Several studies have been performed on compressive strength of concrete for quality control, acceptance of concrete,or for estimating the concrete strength in a structure for the purpose of scheduling construction operations such as form removal for evaluation the adequacy of curing and protection afforded to the structure. Abdul and Mohammed studied the effect of crude oil on compressive and tensile

strength of concrete under short-term and long-term of loading. They had found that about 12.52% reduction in the concrete strength takes place due to the absorption larger amount of crude oil after 60 days soaking [5]. Ayininuola investigated the impact of bitumen and diesel oil contaminated sand on concrete compressive strength he had concluded that a little quantity of diesel oil asabout 2% brought about 3.2 % reduction in the 28 day compressive strength of concrete .Also, he found thatbeyond 58 days of concreting drastic reduction in strength occurred [6].

EXPERIMENTAL WORK

An experimentwas carried out in the laboratory to determine the relationship between internal damage due to loading characteristic and gas oil. Enough of fine aggregates and coarse aggregates and coarse aggregates were stock piled, and were brought from AL-Najaf (south region of Iraq). Ordinary Portland produced by AL-Muthanna cement factory was used in this research, with the initial and final setting time of 130 min and 257 min respectively. Table 1 show the chemical composition of the cement used and analysis by AL-MuthannaUniversity, laboratories of the faculty of construction engineeringtest result of the cement were used conform to Iraqi specification No. 5/1984.

Table 1: Chemical Composition of the Cement

CaO	60.8
SiO_2	21.3
Al_2O_3	4.2
Fe_2O_3	5.7
MgO	3.4
SO_3	1.9
Lime Saturation Factor(LSF)	0.8
Insoluble residue	0.7
C_3A	1.5
AM	0.7

The compressive strength is measured by [ElE-2366 machine] breaking cylindrical concrete specimens in a compression –testing machine. The concrete strength test resultis primarily used to determine that the concrete mixture as delivered meets the requirement of the specified strength in the job specification. Concrete suffers from one major drawback compared with other material. Gas oil in this investigation was brought from AL-Samawa refinery (Iraq). It was stored in air tight plastic containers to prevent losses due to evaporation. Properties of the gas oil are given in table 2. Gas oil analysis was carried by a fuel laboratory in the department of chemical engineering, University of AL-Muthanna.

Table 2: Show the Properties of Gas Oil

Specific gravity at 15.6 C max	0.84
Flash point P.M c min	54
Viscosity cst at 37.8 c max	6
Viscosity cst at c max	5

Method

Concrete Compression Test: the absolute volume method of designwas used to produce concrete of a nominal mix of 1:1.5:3 at water cement ratio of 0.5. The concrete cubes produced were of size 150mmX150mmX150mm. The filling of the mold was in three layers and were manually compacted using 16mm diameter metal rod at minimum strokes of 35. under this concrete cube test, aboutthirty six cubes were produced and cured under different concentration of the water/gas oil in addition to the control medium (water) at 7, 28, 56, 88, 118 and 148 days.

RESULTS AND DISCUSSIONS

The summers of the results of compressive strength of the concrete cubes curve in the two media were shown in table (3) that the curing media have an effecton compressive strength of concretecubes. The value of the control medium (water) maintained a consistent increase in compressive strength as the curing ages increased. This is not surprising as the strength as the age of curing increase but at low strength development. The difference in results under two conditions of curing may be attributed of chemical reaction tacking place in gas solution but absent in control media (water). The result was slightly similar to those obtained by (Ayininuola). Control media water cubes as shown in Figure 1. Under effects of 7 days, the control

Table 3

S/No	Age (Days)	Curing Media	
		Water	Diesel/Water
1	7	29.7	29.5
2	28	39.67	33.59
3	56	42	36.68
4	88	52	49.71
5	118	54.6	36.3
6	148	55	35.607

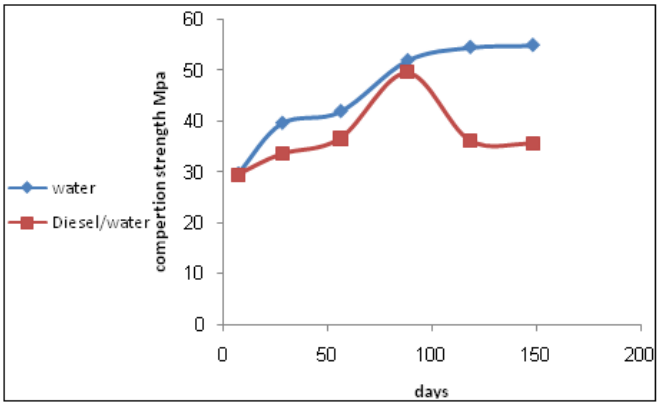

Figure 1: The Different of Compressive Strength of Concert for Two Media

Attained 29.7 Mpa, 28 days 39.67 Mpa compressive strengths. Theseobservedversions in compressive strength were similar to those suggested by British cement Association. For a typical Portland cement the approximate relative proportions of the 28 day strength achieved in 7 days suggest that it should 70 %. Beyond 28 day, the control cubes compressive strength was still rising but at a slower rate for instead at 56 day 42 Mpa 88day 52 Mpa 118 days 54.6 Mpa and 148 days 55 Mpa. The compressive strength respectively. As shown in table 4.

Table 4: The Percentage Reduction in Concrete Compressive Strength Foe Different Curing Media

S/No	Age (Days)	Curing Media	
		Water	Gas Oil/Water
1	7	0	1
2	28	0	15
3	56	0	13
4	88	0	4
5	118	0	34
6	148	0	35

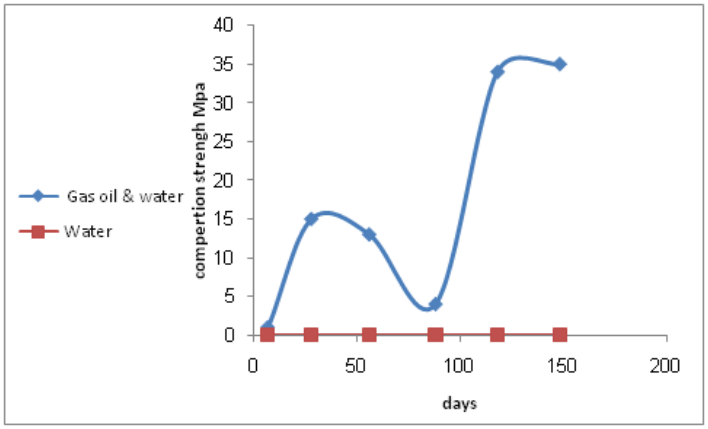

Figure 2: The Reduction in Strength of Compressive with Ages for Two Media

The behavior of compressive strength of concrete cubes cast with gas oil was quite different from those of control cubes as shown in Figure 1. In all cubes investigated for gas oil, there was an initial rapid increase in compressive strength development up to 28 day of concrete casting. Between 28 and 88 days, the rate of strength development continues even though still increasing the rate declined. Beyond 88 day reduction in concrete cubes compressive strength was recorded As revealed trend was noticed throughout in table 3 at 28 day, the cubes compressive strength were 29.5, 33.56, 36.68, 49.71, 36 and 35.607 N/mm^2 for 28, 56, 88, 118, 148 day gas oil respectively. A similar trend of increase in initial compressive strength development up to 88 day of concrete cubes production was noticed for all cubes cast. Beyond 88 days, reduction in cube strength was observed in gas oil/water cubic only.

The concrete compressive strength development depends to a large extent on cement hydration and aggregate –cement paste bond. The cement hydration will continue for a long period of time. Initially, the rate of hydration will be very fast leading to rapid gaining in concrete compressive strength. Inthe presence of water, the cement paste formed a physical bond with both fine and coarse aggregates which resulted to concert strength. Initially, not all cement particles hydrated. The quantities involved in the hydration process in the first few days were. The rate of hydration was very high. But with timelesser cement particles would remain for hydration hence the reduction in the rate of strength development occurs. The surface areas of residual sand particles untreated in cubes were coated with media (water/gas oil), physical bond formation between cement paste and aggregate was hindered. The higher the quantity of media (water/gas oil) present, the higher the barrier to the formation of physical bond responsible for concrete strength would be.

The percent of media (water/gas oil) around the aggregates was responsible for the lower rate of strength development in the concrete cubes cast. The quantity of cement particles available for hydration process was much at the first few days of concert bond generated with aggregate was hindered in strength development rate still occurred this account for the observed increase in the compressive strength water and media (water/gas oil), concert cubes up to 58 and 88 days of concerting respectively. This action reduced the rate of bond formation between cement paste and aggregates, which account for the reduction in compressive strength observed.

CONCLUSIONS

After the experimentationsobservations, and analysis on the effect of water/gas oil condition on concrete compressive strength the following conclusions: All the concrete specimens cured in control media (water) increased steadily in compressive strength as age increases from 3, 7, 28, 56, 88, 118 and 148 days. All the concrete specimens cured in mixed media (water/gas oil) increased steadily when compressive strength ages increased from 3, 7, 28, 56 and 88 days.

Compressive strength of reduction for all concrete cubic specimens cured in control media (water) were steadily in in percentage through 148 days. Compressive strength of reduction for all concrete cubic specimens curing (water/gas oil)were different in percentage (1, 15, 13, 4, 34 and 35).

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